

## CLAIMS

### WHAT IS CLAIMED IS:

1. A material for providing baffling, sealing, adhesion or reinforcement to  
5 an article of manufacture, the material comprising:  
an epoxy/elastomer adduct, the adduct including an epoxy component that is  
at least partially reacted with an elastomer, wherein the elastomer includes a butyl  
nitrile rubber;  
an epoxy resin; and  
10 a curing agent.
2. A material as in claim 1 further comprising a filler, an elastomeric  
material and a blowing agent, the filler being calcium carbonate, the blowing agent  
including an azodicarbonamide, the elastomeric material being a carboxy terminated  
15 nitrile rubber and wherein the epoxy resin is a standard liquid epoxy resin.
3. A material as in claim 1 wherein the epoxy/elastomer adduct includes a  
catalyst, the catalyst being selected from a phosphine and an iodide.
- 20 4. A material as in claim 1 wherein the epoxy/elastomer adduct includes a  
catalyst, the catalyst being a triphenyl phosphine.
5. A material as in claim 1 wherein the epoxy/elastomer adduct includes a  
catalyst, the catalyst being an ethyl triphenyl phosphonium iodide.  
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6. A material as in claim 1 wherein the material is an adhesive material  
that exhibits a lap shear strength of at least 1500 psi and a peel strength of greater  
than 45 lb/in.
- 30 7. A material as in claim 1 wherein the epoxy component of the  
epoxy/elastomer adduct has an epoxy equivalent weight between about 100 EEW  
and about 1000 EEW.

8. A material as in any of claim 1 wherein:
- i. the material is an expandable structural adhesive for providing adhesion to an automotive vehicle;
  - ii. the epoxy component is provided as a phenolic resin;
  - 5 iii. the adduct exhibits a viscosity of at least about 500 Pa-s at a temperature of about 100 °C and a shear rate of 400 s<sup>-1</sup>;
  - iv. the epoxy resin is about 20% to about 40% by weight of the material;
  - v. the material expands to a volume that is at least 140% of its original unexpanded volume and the expandable material exhibits adhesive properties that are relatively insensitive to bondline size.
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9. A material as in any of claims 1, wherein:
- i. the epoxy component is between about 70% and about 85% by weight of the adduct;
  - 15 ii. the epoxy component is provided as a phenolic resin including at least one of a bisphenol-A epichlorohydrin ether polymer or a solid bisphenol-A epoxy resin;
  - iii. the epoxy component has a molecular weight between about 900 amu and about 1300 amu, an epoxy equivalent weight between about 100 EEW g/mol and about 1000 EEW and a softening point between about 65 °C and about 75 °C;
  - 20 iv. the elastomer is between about 15% and about 35% by weight of the adduct;
  - v. the elastomer has a carboxyl content of between about 0.05 and about 0.1 equivalents per hundred rubber;
  - 25 vi. the adduct includes a reactive diluent; and
  - vii. the adduct exhibits a viscosity of at least about 600 Pa-s at a temperature of about 100 °C and a shear rate of 400 s<sup>-1</sup>; and
  - viii. the epoxy resin is about 25% to about 35% by weight of the material;
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10. An epoxy/elastomer adduct comprising:  
an epoxy component;  
an elastomer, the elastomer including a butyl nitrile rubber;

wherein the epoxy component is at least slightly reacted with the elastomer.

11. An epoxy/elastomer adduct as in claim 10 further comprising a catalyst, the catalyst being selected from a phosphine and an iodide.

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12. An epoxy/elastomer adduct as in claim 10 further comprising a catalyst, the catalyst being a triphenyl phosphine.

13. An epoxy/elastomer adduct as in claim 10 further comprising a catalyst, the catalyst being an ethyl triphenyl phosphonium iodide.

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14. An epoxy/elastomer adduct as in claim 10 wherein the epoxy component is provided as a phenolic resin and wherein the adduct exhibits a viscosity of at least about 500 Pa-s at a temperature of about 100 °C and a shear rate of 400 s<sup>-1</sup>.

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15. An epoxy/elastomer adduct as in claim 10 wherein the epoxy component is between about 70% and about 85% by weight of the adduct and the elastomer is at least about 15% by weight of the adduct.

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16. An epoxy/elastomer adduct as in claim 10 wherein the epoxy component is provided as a phenolic resin including at least one of a bisphenol-A epichlorohydrin ether polymer or a solid bisphenol-A epoxy resin.

17. An epoxy/elastomer adduct as in claim 10 wherein the epoxy component has a molecular weight between about 900 amu and about 1300 amu, an epoxy equivalent weight between about 100 EEW g/mol and about 1000 EEW and a softening point between about 65 °C and about 75 °C.

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18. An epoxy/elastomer adduct as in claim 10 wherein the elastomer is between about 15% and about 35% by weight of the adduct and the elastomer has a carboxyl content of between about 0.05 and about 0.1 equivalents per hundred rubber.

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19. An epoxy/elastomer adduct as in claim 10 further comprising a reactive diluent wherein the adduct exhibits a viscosity of at least about 600 Pa-s at a temperature of about 100 °C and a shear rate of 400 s<sup>-1</sup>.

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20. A method of forming an epoxy/elastomer adduct, the method comprising:

providing an epoxy component, wherein the epoxy component is provided as a phenolic resin including at least one of a bisphenol-A epichlorohydrin ether polymer  
10 or a solid bisphenol-A epoxy resin;

providing an elastomer, the elastomer being a butyl nitrile rubber;

mixing at least about 70 parts by weight of the epoxy component with at least about 15 parts by weight of the elastomer in the presence of a catalyst such that the epoxy component at least slightly reacts with the elastomer to form the adduct,  
15 the catalyst being selected from a phosphine and an iodide.

21. A method as in claim 20 wherein the step of mixing includes introducing the epoxy component, in a solid state, and the elastomer, in a solid state, to an extruder, which melts and mixes the epoxy component with the elastomer.

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22. A method as in claim 20 wherein the catalyst is selected from an ethyl triphenyl phosphonium iodide and a triphenyl phosphine.

23. A method as in claim 20 wherein the mixing step produces an adduct  
25 that exhibits a viscosity of at least about 600 Pa-s at a temperature of about 100 °C and a shear rate of 400 s<sup>-1</sup>.